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UPPER MIOCENE MOLLUSCA FROM SPRINGVALE, TRINIDAD, BRITISH WEST INDIES

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The importance of the upper Miocene fauna occurring at Springvale, Trinidad, British West Indies, has been recognized since the locality was first reported in 1910 but, although it has received attention in reports dealing with the general problem of the Miocene faunas of the Island, it has not been the subject of any detailed study.

A collection of fossils from the Tertiary deposits of Trinidad recently received by the Department of Geology and Invertebrate Palaeontology of The American Museum of Natural History from Mr. Carlos H. Jooss of Georgetown, British Guiana, contains a representative suite of mollusca from this locality which has furnished the basis for the present study.

The Springvale fauna is known from a quarry in west central Trinidad, which is "situated on the side of a low hill, one of the lateral spurs of the Montserrat range" (Guppy, 1911, p. 195) in "Caroni County, Couva Ward, at Springvale, on Mount Pleasant Road and three-fourths to one mile south of Milton" (Mansfield, 1925, p. 7). Maury (1925, p. 162) has reported deposits of Springvale age from other localities on the Island but in the type region it is definitely known only from the one quarry. The strata are covered by recent deposits and their extent is not certainly known.

The discovery of the Springvale locality was reported in 1910 by R. J. Lechmere Guppy in a paper 'On a collection of fossils from Springvale, near Couva, Trinidad' presented before the Agriculture Society of Trinidad and Tobago, and published as Society paper No. 440. Appended was a 'List of the Miocene Molluska of Trinidad, 1910' in which 31 species of mollusca, 1 barnacle and 1 echinoderm were indicated as occurring here. In the following year a report, 'Fossils from Springvale near Couva, Trinidad—Second Report—In Continuation on Society Paper No. 440,' published as Society paper No. 454, added 22 species of mollusca to the list including 5 new forms, described as: *Natica cuspidata, Capulus effluens, Solenosteira semiglobosa, Solenosteira co-*

chlearis and *Raëta meridionalis.* A sixth species, listed as "*Placenta patinata* new species near *orbicularlis*" and without any indication as to the location from which it was obtained, is a *nomen nudum,* lacking both description and figure.

In these reports Guppy indicated that the Springvale deposits were of Miocene age, considering them as approximately equivalent to the Bowden Beds of Jamaica.

In 1925, Dr. C. J. Maury in a report entitled 'A Further Contribution to the Palaeontology of Trinidad (Miocene Horizons)' described 32 species of pelecypods and 47 gastropods from this locality. Thirty-eight of the species are new. The fauna is referred to the lower part of the upper Miocene (p. 168).

Later, during the same year, Dr. W. C. Mansfield contributed 'Miocene Gastropods and Scaphopods from Trinidad, British West Indies.' He lists 24 species of gastropoda and 1 pelecypoda from Springvale, describing 7 new species of gastropoda. The fauna is "tentatively referred to the upper Miocene."

COMPOSITION OF THE MOLLUSCAN FAUNA

The reports of Maury and Mansfield with some modifications based upon the present collection, together with the fossils in The American Museum of Natural History, permit the following faunal list from the Springvale locality[1]:

PELECYPODA	Maury	Mansfield	Amer. Mus. Coll
Nuculana species			X
Arca (*Arca*) *occidentalis miocica*, n. subsp.	X		*
Anadara (*Anadara*) *confugium* (Maury)	*		
Anadara (*Anadara*) *couwae* (Maury)	*		
Anadara (*Anadara*) *fontinalis* (Maury)	*		X
Anadara (*Anadara*) *springvalensis*, n. sp.			*
Anadara (*Anadara*) *tectum-columbae* (Maury)	*		X
Anadara (*Anadara*) *thauma* (Maury)	*		X
Barbatia (*Cucullaria*) *perinopinata* Maury	*		X
Noetia centrota Guppy	X		
Ostrea (*Lopha*) *haitensis* Sowerby	X		X
Ostrea (*Lopha*) *messor* Maury	*		X
Pecten (*Pectren*) *archon* Maury	*		X

[1] Those species marked with an asterisk were described from this locality in the report indicated; those marked with the symbol "X" are reported as present here.

	Maury	Mansfield	Amer. Mus. Coll.
Chlamys (*Plagioctenium*) *demiurgus* (Dall)	X		X
Chlamys (*Plagioctenium*) *reedsi*, n. sp.			*
Amusium (*Amusium*) *rex-maris* Maury	*		X
Anomia simplex d'Orbigny			X
Volsella (*Volsella*) *waringi* (Maury)	*		X
Crenella divaricata d'Orbigny	X		X
Eucrassatella trinitarius (Maury)	*		X
Eucrassatella montserratensis (Maury)	*		X
Crassinella guppyi Dall	X		X
Venericardia (*Pleuromeris*) cf. *acaris* Dall			X
Trachycardium caroniense Maury	*		
Trachycardium couvense Maury	*		
Laevicardium serratum (Linnaeus)	X		
Dosinia (*Dosinidia*) *titan* Maury	*		X
Clementia dariena Conrad			X
Macrocallista (*Paradione*) *maculata* (Linnaeus)	X		X
Pitar species			X
Antigona (*Dosina*) *mauryae*, n. sp.			*
Chione (*Chione*) *pubera* (Valenciennes)	X		
Chione (*Chione*) *springvalensis*, n. sp.			*
Chione (*Lirophora*) *caroniana* Maury	*		X
Tellina (*Tellinella*) *caroniana* Maury	*		X
Tellina couvaënsis, n. sp.			*
Metis trinitaria Dall	X		X
Semele claytoni couvensis Maury	*		
Semele anteriocosta, n. sp.			*
Pleiorytis caroniana (Maury)	*		X
Psamosolen (*?*) *mansfieldi*, n. sp.			*
Raëta meridionalis Guppy	X		X
Pholadomya, n. sp.			X
Corbula (*Corbula*) *isla-trinitatis* (Maury)	X		X
Corbula (*Caryocorbula*) species			X
Gastrochaena couvana, n. sp.			*
Kuphus incrassatus Gabb	X		X
GASTROPODA			
Terebra (*Paraterebra*) *sulcifera* Sowerby	X		
Terebra (*Paraterebra*) *bipartita* Sowerby	X		
Crassispira henekeni caroniana (Maury)	*		X
Knefastia (*?*) *springvaleënsis* (Mansfield)		*	
"*Drillia*" aff. *D. riogurabonis* Maury		X	
Conus (*Leptoconus*) *medialira*, n. sp.			X
Conus (*Leptoconus*) *springvaleënsis* Mansfield		*	*

	Maury	Mansfield	Amer. Mus. Coll.
Conus (*Lithoconus*) *couvaënsis*, n. sp.			*
Conus (*Dendroconus*) *maga*, n. sp.	X		*
Conus species (*C. planiliratus* Sow. of Maury)	X		
Cancellaria (*Cancellaria*) *auriculaperta*, n. sp.			*
Cancellaria (*Cancellaria*) *couvana*, n. sp.			*
Cancellaria (*Cancellaria*) *montserratensis* Maury	*		X
Cancellaria (*Cancellaria*) *springvaleënsis* Mansfield		*	
Oliva (*Oliva*) *cylindrica* Sowerby	X	X	X
Oliva (*Oliva*) *couvana* Maury	*		X
Olivella (*Dactylidia*) *mutica* Say	X		
Ancilla (*Eburna*) *caroniana* Maury	*	X	X
Ancilla (*Eburna*) *caroniana springvaleënsis* Mansfield		*	X
Marginella (*Egouana*) *calypsonis* Maury	*	X	X
Marginella (*Leptegouana*) *springvalensis* Maury	*	X	X
Marginella (*Volutella*) *maiae* Maury	*		
Marginella (*Persicula*) *couviana* Maury	*		
Marginella (*Persicula*) *propeobesa* Mansfield		*	
Marginella (*Closia*) *lachrimula* Gould ?		X	
Mitra (*Tiara*) *couvensis* Maury	*	X	X
Mitra (*Tiara*) *sancti-francisci* Maury	*		
Mitra (*Tiara*) *woodringi*, n. sp.			*
Xancus trinitatis Maury	*		X
Xancus praeovoideus Maury	X		
Latirus (*Polygona*) *infundibulum polius* Woodring			X
Fasciolaria, sp. indet.	X		
Fusinus springvalensis (Maury)	*		X
Melongena consors Sowerby	X		
Tritiaria (*Antillophos*), n. sp.			X
Solenosteira semiglobosa Guppy	X	X	X
Solenosteira semiglobosa cochlearis Guppy	X		X
Murex (*Murex*) *recurvirostris* Broderip			X
Murex (*Phyllonotus*) *cornurectus* Guppy	X		
Cassis species aff. *tuberosa* Lamarck			X
Semicassis (*Tylocassis*) *maleaformis*, n. sp.			*
Ficus carbasea (Guppy)	X		X
Cypraea caroniensis Maury	*		X
Bittium species		X	
Vermicularia spirata (Philippi)	X		X
Vermicularia cf. *eburneus* Reeve		X	
Lementina papulosa (Guppy)	X		X
Lementina decussata (Gmelin)	X		
Petaloconchus alcimus Mansfield	X	*	X
Turritella planigyrata Guppy	X	X	X

Turritella trinitaria Maury	*		X
Turritella guppyi Cossmann (*tornata* Guppy, not Klipstein)	X		
Architectonica (*Architectonica*) *nobilis* ((Bolten) Roëding)	X		X
Rissoa species			X
Capulus efluens Guppy[1]			
Capulus (*Malluvium*) species			X
Calyptraea centralis (Conrad)			X
"*Calyptraea*," n. sp.			X
Crepidula fornicata Linnaeus	X		X
Natica youngi Maury	*	X	X
Natica (*Naticarius*) *canrena* Morch	X	X	X
Natica cuspidata Guppy	X	X	X
Polinices stanislas-meunieri Maury	X		X
Polinices springvalensis Maury	*		X
Polinices cf. *subclausa lavelana* Hodson			X
Sinum naticoidalis, n. sp.			*
Epitonium (*?*) *leroyi* (Guppy)	X		X
Turbonilla species		X	
Eulima egregia Guppy	X		X
Calliostoma (*Calliostoma*) *caroniana* Maury	*		
Solariella caroniana Maury	*		X
Teinostoma (*Pseudorotella ?*) *caroniense* Maury	*		X
Fissuridea species		X	

A summary of the preceding list shows:

	PELECYPODA			GASTROPODA			TOTAL		
	New	Previously Described	Total	New	Previously Described	Total	New	Previously Described	Total
MAURY	19	13	32	19	26	45	38	39	77
MANSFIELD		1	1	7	17	24	7	18	25
AMER. MUS. COLL.	9	30	39	8	41	49	17	71	88
FAUNA	28	19	47	34	38	72	63	57	120

Of these, three pelecypods and six gastropods have not received specific names, leaving a total of 111 named species. Woodring (1928, p. 22), lists a fauna of 610 species from the Middle Miocene at Bowden, Jamaica, and estimates that a tropical molluscan fauna including every ecologic nitch from shore to a depth of 100 fathoms, plus the pelagic forms, would include about 1000 species. No one fossil locality can be expected to yield a complete fauna. Nevertheless, these figures do serve to emphasize that our knowledge of the Springvale molluscà is still incomplete. Further collecting should record many additional species from this locality.

[1] Described from Springvale, but not subsequently reported.

NOTES ON THE ECOLOGY OF THE SPRINGVALE FAUNA

The present incomplete knowledge of this fauna as well as the paucity of the data on the ecology of the recent marine molluscan faunas does not permit an adequate analysis of the ecologic factors which obtained during the period of the deposition at Springvale. However, enough can be adduced to permit some suggestions pertinent to the problem at hand.

SALINITY.—None of the species at present reported tend to suggest the presence of waters of less than the normal salinity of the open sea. Further, the absence of species referable to *Neritina*, *Corbicula*, the Cerithiidae, and other generic groups which are more commonly found in waters of less than normal salinity, indicates that no fresh or brackish waters emptied into the sea in the immediate vicinity.

CHARACTER OF THE BOTTOM.—The matrix, observable on the fossils, is a fine to medium sand with an abundant admixture of clay. No pebbles have been noted. Insofar as records based mainly on shore collecting are available, the majority of the genera represented in the fauna are those which are to be expected on this type of deposit. Genera represented in the fauna which either prefer or often may be found on, or in, sand or sandy mud, include[1]:

Pecten	*Eucrassatella*	*Dosinia*
Venericardia	*Trachycardium*	*Laevicardium*
Macrocallista	*Antigona*	*Chione*
Tellina	*Metis*	*Semele*
Corbula	*Kuphus*	*Terebra*
Crassispira	*Cancellaria*	*Oliva*
Olivella	*Ancilla*	*Marginella*
Mitra	*Murex*	*Ficus*
Turritella	*Architectonica*	*Natica*
Polinices	*Sinum*	

Woodring (1928, p. 31) lists *Conus*, *Mitra* and *Murex* among the genera that lurk beneath or among stones, and *Arca* among those which nest between the stones. Records in Carpenter (*op. cit.*) seem to indicate that *Conus* retreats under stones when exposed by the ebb tide, but when not thus exposed it may occur "on sands in small ponds of sea water" and on "sandy mud" (pp. 181, 205, 270). The same seems to hold true for *Mitra* and *Murex*. Specimens of *Murex recurvirostris*

[1] In this connection attention is directed to the 'Report on the Present State of Our Knowledge with regard to the Mollusca of the West Coast of North America,' by Dr. P. P. Carpenter, in the Report of the British Association for the Advancement of Science for 1856 (1857), pp. 159–368. This is in part a compilation of all published reports up to that time listing mollusca from that region, together with any reliable data as to the habitat and depth from which the specimens were collected.

Broderip are stated to have been taken by Cuming from sandy mud at 9 fathoms (p. 182). These genera are active predators and undoubtedly range widely along the bottom below the areas exposed by the tide.

All of the specimens of *Arca* (*Arca*) *occidentalis miocica* are of individual valves and may have been transported before burial. All, save one, are too well preserved to lend much support to this possibility; the exception is somewhat broken and well covered by bryozoa. It is possible that the large shells of *Ostrea* (*Lopha*) *haitensis* Sowerby furnished suitable places for "nesting" and byssal attachment. The majority of the specimens of *Anadara* have both valves in association, arguing against subsequent transportation. Not rarely, species of this genus appear to be taken from sand and sandy mud below low tide level. (Carpenter, 1857, pp. 183, 277–8.)

Gastrochaena is the only boring pelecypod recognized. The species of this genus bore into shells as well as coral and soft rock. The specimens of *Ostrea haitensis* show bore holes, although none are of sufficient size to accommodate the single large specimen in the collection. The valves of this individual are in association, one crushed within the other, suggesting again an absence of transportation before burial.

Cypraea and *Xancus* appear to be wholly partial to stony environments and no records of their occurrence on sandy or muddy bottoms have been noted. While neither genus is common in the collection they are not rare and the shells are not worn. They furnish an unexplained element in the fauna. *Latirus* is most commonly found among or under stones and is well represented in the fauna. The great majority of the specimens are covered with bryozoa and do not preclude the possibility of their being an introduced element.

If, as seems most probable, the bottom was a sandy mud, the entire absence of species of *Glycymeris* and of the *Lucinidae*, together with a relative rarity of *Cardiidae* in all reported collections from Springvale is not easily explained. All are normally abundant in the Miocene faunas of the West Indian and Caribbean region and all prefer the type of substratum which seems to have been present here. It must be assumed that some ecologic factor as yet not evident for this fauna is responsible for this condition.

Depth.—All factors seem to indicate relatively shallow waters during the period of deposition. No deep sea forms have been reported. *Raëta* (*R. meridionalis*) which normally lives in waters of less than 50 fathoms, is a significant element in the fauna. All the specimens which

have been observed or reported have both valves in association and the same holds true for the majority of specimens of *Dosinia* (*Dosinidia*) *titan* Maury and the species of *Eucrassatella*.

Arca (Arca) occidentalis Phillipi **miocica,** new subspecies

Figure 1

Arca occidentalis PHILLIPI, MAURY, 1925, p. 186 (Springvale record only).

HOLOTYPE.—No. 24983[1]; length 67.8 mm.; height 30.0 mm.; diameter (one valve) 16.5 mm.

The fossils from Springvale differ from the recent *Arca occidentalis* in the possession of a deeper flexure extending from the umbo to the posterior emargination resulting in a more sharply delimited posterior dorsal area. The ribbing on the shell between the median umbonal depression and the posterior keel immediately ventral to the posterior emargination tends to be much finer, the interspaces being twice the width of the rib. Each interspace is generally marked by a median secondary riblet with three to five fine, microscopic tertiaries on each side.

This subspecies appears to be a geographic variant of the typical *A. occidentalis* stock which is present in the middle Miocene at Bowden and on the Island of Santo Domingo. Specimens in the collections of the American Museum from the Pliocene of Trinidad are to be referred to *A. o. occidentalis* rather than to this subspecies.

Anadara (Anadara) thauma (Maury)

Scapharca (*Scapharca*) *thauma* MAURY, 1925, p. 214.

Arca (*Scapharca*) *thauma* MAURY, 1925, Pl. XII, fig. 3.

The tendency toward the development of medial grooves on the radial ribs of this species is to be noted over the entire surface of the valve rather than only on the anterior and posterior regions, though the grooving may be obsolete over the median portion of the surface. The posterior ribs are commonly as strongly grooved as those on the anterior area of the shell.

A. thauma resembles *A. hallidonta oresta* (Woodring) (1925, p. 43, Pl. IV, figs. 5, 6) but differs in being proportionally more elongate and in possessing a greater number of radial ribs, there being 34 in the Bowden species and 38 to 40 in *A. thauma*.

The original figures of *A.* (*Anadara*) *tectum-columbae* (Maury) (1925, p. 204, Pl. XVIII, fig. 4), and of *A.* (*Anadara*) *fontinalis* (Maury)

[1] All specimens described and figured are in the collections of the Department of Palaeontology at The American Museum of Natural History.

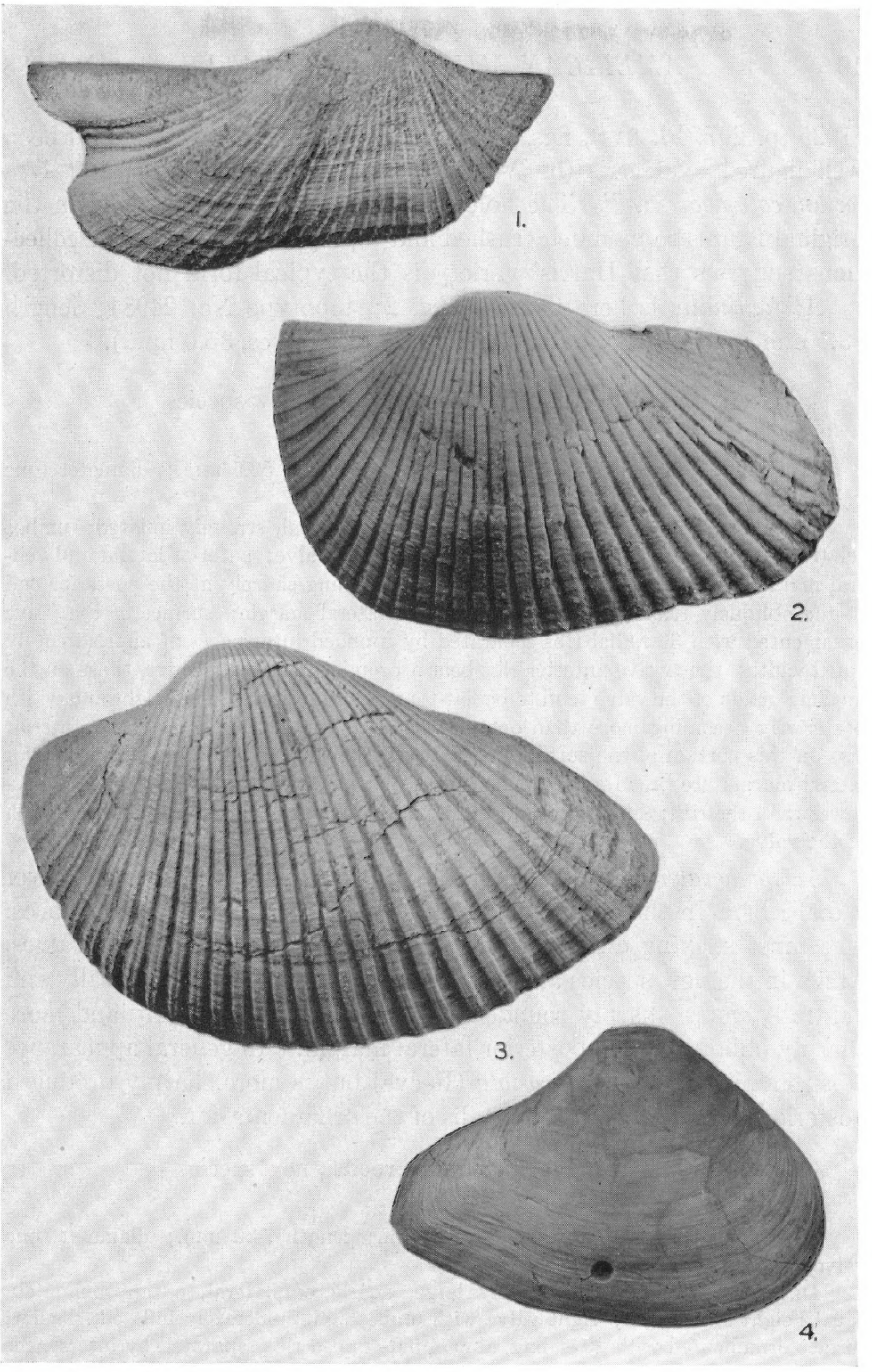


Fig. 1. *Arca* (*Arca*) *occidentalis miocica*, n. subsp. Holotype, No. 24983; ×1.
Fig. 2. *Anadara* (*Anadara*) *fontinalis* (Maury). Topotype, No. 24984; ×1.
Fig. 3. *Anadara* (*Anadara*) *springvalensis*, n. sp. Holotype, No. 24985; ×1.
Fig. 4. *Eucrassatella montserratensis* (Maury). Topotype, No. 24473; ×1.

(1925, p. 207, Pl. XVII, figs. 7, 8) are defective. The former has been well figured by Harris (in Waring, 1926, Pl. XX, figs. 1, 2) as "*Arca tectum-columbae* var." The holotype of this species appears from the original figures to be much crushed and topotype material in our collections suggests that Harris' variety is the typical form not distorted.

A. fontinalis is here figured (Fig. 2; topotype No. 24984; length 73.5 mm.; height 43.6 mm.; diameter, both valves, 35.0 mm.).

Anadara (Anadara) springvalensis, new species

Figure 3

HOLOTYPE.—No. 24985; length 83.8 mm.; height 52.5 mm.; diameter (one valve) 25.5 mm.; length of cardinal area 62.6 mm.

DESCRIPTION.—Shell large, elongate, subtrapezoidal, strongly inflated; umbos relatively small, situated at the anterior third of the valve; anterior lateral and ventral margins broadly and regularly rounded, rounding sharply at the posterior end to the obliquely truncated, straight posterior lateral margin; surface of the valve ornamented with 36 radial ribs separated by rounded interspaces of approximately equal width; the twelve anterior ribs bear a prominent medial groove, those on the medial portion of the valve tend to be flat-topped and to increase in height and width posteriorly becoming more than one and one-half times the width of the anterior ribs on this portion of the surface of the valve; the ribs extending to the posterior lateral margin are broad and low, becoming obsolete dorsally with interspaces narrower than the ribs; hinge typical but relatively short as compared with the length of the valve.

A. springvalensis differs from *A. thauma* Maury in possessing fewer radial ribs. In the latter species these are wider than the interspaces. The most striking difference, however, is in the shape of the valves, which in the new species are more broadly rounded anteroventrally and ventrally, more sharply rounded to sub-angulate posteriorly and more sharply oblique on the posterior lateral margin. In general appearance it is reminiscent of *A. seticostata* (Reeve) but is more sharply produced posteriorly and differs in the details of the ornamentation.

Chlamys (Plagioctenium) reedsi, new species

Figure 7

HOLOTYPE.—No. 24989; height 75.6 mm.; length 74.0 mm.; diameter (one valve) 16.5 mm.

DESCRIPTION.—Shell moderately large, nearly equilateral, of approximately equal height and length; right valve with umbo high, moderately inflated, slender; surface ornamented with 20 strong, almost flat-topped ribs separated by interspaces of slightly narrower width; ribs and interspaces marked by fine, sub-microscopic radial striae visible only toward the periphery of the valve; concentric sculpture consisting of fine, raised lamellae which are visible only on the sides of the ribs on the upper part of the shell; submargins marked by three fine radial threads delimit-

ing them from the disk, with concentric sculpture finer than on the disk; ears subequal, anterior with four primary and four secondary radial ribs; posterior smooth dorsally and with eight radial ribs ventrally.

Chlamys (*Plagioctenium*) *demiurgus* (Dall) (1898, III, pt. 4, p. 718, Pl. XXVI, fig. 3) with which *C. reedsi* is associated at Springvale tends to be longer than high, has a shorter anterior margin, lacks the fine radial striae on the ribs and interspaces and differs in the details of the ornamentation of the auricles. The fine concentric lamellae on *C. reedsi* probably over-rode the radial ribs as in *C. demiurgus*, but have been eroded away.

This species is named in honor of Dr. Chester A. Reeds, former Curator of the Department of Geology and Invertebrate Palaeontology of The American Museum of Natural History, who arranged for the acquisition of the collection here described.

Amusium rex-maris Maury

Amusium rex-maris MAURY, 1925, p. 242, Pl. XXVI, fig. 1.

The holotype of this species has only the interior of the valve exposed. A topotype in our collection shows that this species lacks umbonal sculpturing on the exterior of the valve.

Anomia simplex d'Orbigny

Anomia simplex D'ORBIGNY, 1845, in de la Sagra, 'Hist. Fiscia, Pol. y Nat. Isla de Cuba,' V, *Moluscos*, p. 371, Atlas, p. 75, Pl. XLIII, fig. 4.

Anomia ephippium CONRAD, 1845, 'Medial Tert. Fossils,' p. 75, Pl. XLIII, fig. 4. Not *A. ephippium* LINNAEUS, 1758, 'Syst. Nat.,' Ed. 10, p. 701.

The specimens referred to this species are somewhat larger than the normal recent form and tend to be marked by an extra thickening of the shell along the dorsal margin. They are normal in all other characteristics.

Eucrassatella montserratensis (Maury)

Figure 4

Crassatellites (*Scambula*) *montserratensis* MAURY, 1925, p. 328, Pl. XLII, fig. 3.

TOPOTYPE.—No. 24473; length 55.0 mm.; height 38.6 mm.; diameter (both valves) 20.0 mm.

The holotype is an imperfect example, incomplete ventrally and apparently somewhat distorted by pressure. The specimen here figured is almost perfect and permits the following additional notations concerning this species: The valves are equal and equally convex; the posterior end may be somewhat more produced than is indicated by

the type, and the umbo is slightly anterior to the mid-line of the valve; the anterior dorsal margin is slightly convex, the anterior lateral margin broadly and regularly rounded, the ventral edge almost straight becoming slightly concave posteriorly at the sulcation in front of the umbonal carina. The posterior lateral margin is short and almost straight.

E. montserratensis may be distinguished from *E. trinitarius* (Maury) (1925, p. 327, Pl. XLII, figs. 1, 7; as *Crassatellites* (*Scambula*)) also described from Springvale, by the higher more inflated umbos, the coarser concentric umbonal waves, the smooth anterior region of the shell and the narrower posterior sulcation.

Venericardia (Pleuromeris) cf. **acaris** Dall

cf. *Venericardia* (*Pteromeris*) *acaris* DALL, 1903, III, pt. 6, p. 1434, Pl. LVI, fig. 4.

Three left valves agree in shape and in the number and character of the radial ribs with this species which was described from the Bowden Beds of Jamaica. However, the row of oblique rugae along the margin of the lunule has not been observed. (See Woodring, 1925, p. 102.)

Antigona (Dosina) mauryae, new species

Figure 10

HOLOTYPE.—No. 24463; length 84.0 mm.; height 70.0 mm.; diameter (both valves) 34.4 mm.

DESCRIPTION.—Shell large, elongate-ovate, inequilateral, moderately inflated; umbos small, low, strongly prosogyrate, situated within the anterior third of the shell; lunule moderately large, elongate, poorly delimited; escutcheon large, excavated, prominent, on left valve; absent on right; anterior lateral margin broadly and regularly rounded, ventral strongly convex; posterior dorsal margin strongly convex, posterior end sub-truncate, sharply round ventrally, slightly concave dorsally; a broad concave area extends from the umbos to the posterior lateral margin; surface ornamentation consisting of low, rounded, radiating ribs separated by interspaces of equal width; superimposed are prominent concentric lamellae, sub-equally spaced and crenulated by the radial ribbing; hinge and interior not seen.

This species is probably to be considered the Miocene precursor of the recent *A.* (*Dosina*) *listeri* (Gray). As figured by Palmer (1927–1929, Pl. XXVIII, figs. 2–11) that species is relatively less elongate with more prominent umbos and differs considerably in outline, particularly in the posterior portion of the valve. All other described species of this subgenus from this region appear to have larger and more inflated umbos and to be relatively less elongate.

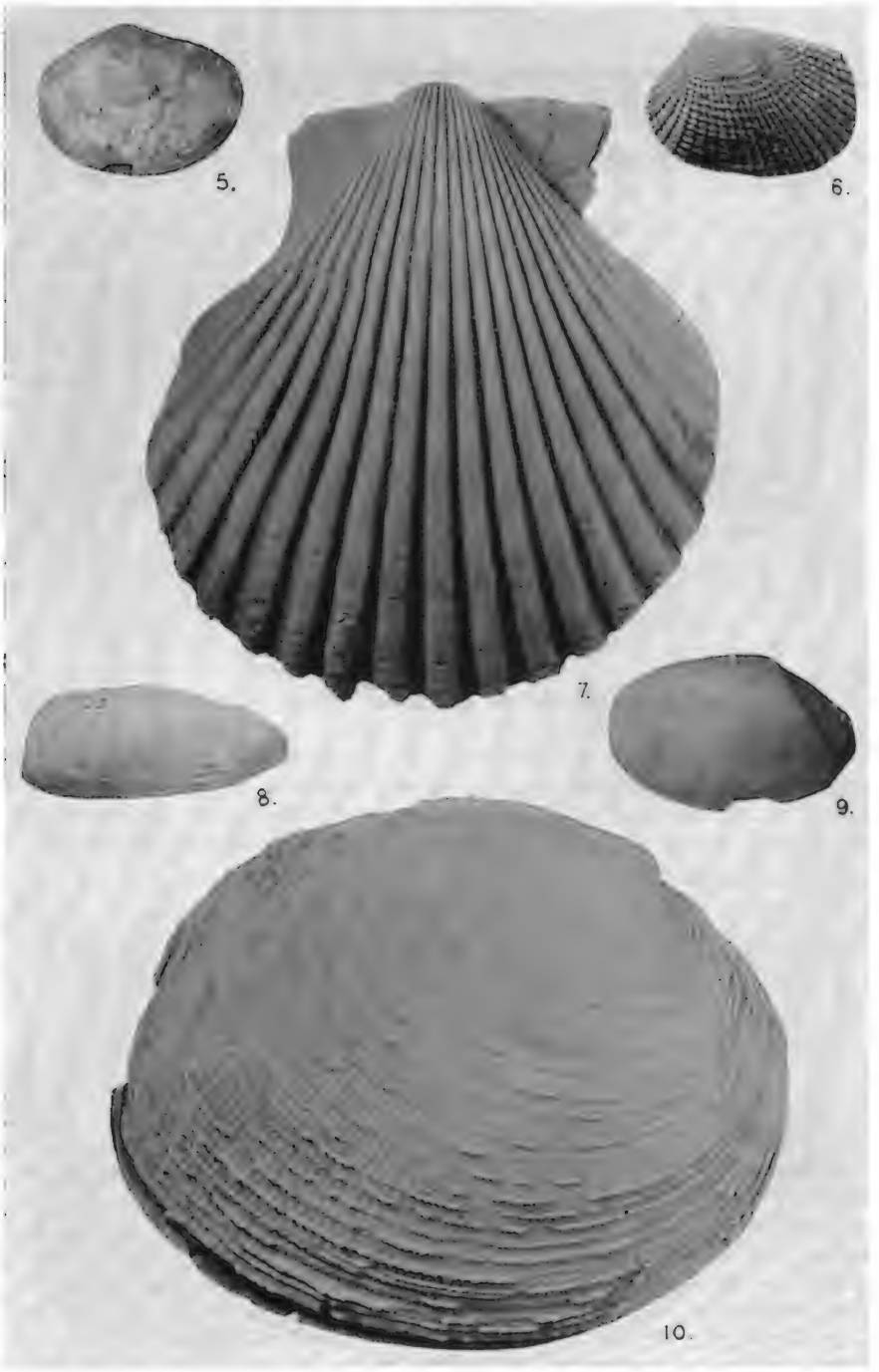


Fig. 5. *Semele anteriocosta*, n. sp. Holotype, No. 24986; ×1.
Fig. 6. *Chione* (*Chione*) *springvalensis*, n. sp. Holotype, No. 24987; ×4.5.
Fig. 7. *Chlamys* (*Plagioctenium*) *reedsi*, n. sp. Holotype, No. 24989; ×1.
Fig. 8. *Gastrochaena couvana*, n. sp. Holotype, No. 24990; ×2.
Fig. 9. *Tellina couvaënsis*, n. sp. Holotype, No. 24812; ×1.
Fig. 10. *Antigona* (*Dosina*) *mauryae*, n. sp. Holotype, No. 24463; ×1.

Chione (Chione) springvalensis, new species

Figure 6

HOLOTYPE.—No. 24987; length 5.5 mm.; height 4.0 mm.; diameter 1.6 mm.

DESCRIPTION.—Shell small, moderately inflated, elongate-ovate; umbos anterior, situated just behind the anterior one-fourth of the valve; surface ornamented with about 28 strong radial ribs which tend to be deeply grooved or bifurcate on the ventral half, radials crossed by concentric lamellae which became somewhat beaded on the ribs; lunule large, bounded by a shallow groove and marked by microscopic radial striations; escutcheon long, moderately broad, smooth, with a distinct groove paralleling the ligamental area; hinge typical.

This small species resembles the Bowden form *Chione* (*Chione*) *returgida* Woodring (1925, p. 161, Pl. XXII, figs. 5, 6) in size and general outline, but differs in the more anteriorly situated umbos and in the details of the sculpturing.

Tellina couvaënsis, new species

Figure 9

HOLOTYPE.—No. 24812; length 32.7 mm.; height 19.5 mm.; diameter (both valves) 8.6 mm.

DESCRIPTION.—Shell of medium size, thin, elongate-ovate, inequilateral, moderately inflated; anterior end, broad, produced, rounded; posterior short, slightly flexed, roundly pointed; umbos at posterior third of the valve; surface polished, marked only by weak, distant, concentric rugae; interior of shell not observed.

This species is represented only by the holotype and until the hinge and pallial sinus can be studied it is not possible to make a definite assignment to any section of the genus *Tellina*. It somewhat resembles the Bowden species *T.* (*Eurytellina*) *spiekeri* Woodring (1925, p. 168, Pl. XXIII, figs. 10, 11) but is larger than that form, rostrate and more sharply rounded posteriorly.

Semele anteriocosta, new species

Figure 5

HOLOTYPE.—No. 24986; length 26.3 mm.; height 18.8 mm.; diameter (both valves) 7.0 mm.

DESCRIPTION.—Shell relatively small, elongate-ovate; umbos low, slightly posterior; posterior dorsal margin slightly convex, anterior broadly convex, anterior and ventral margin broadly and regularly rounded, posterior almost straight; a marked umbonal groove parallels the posterior dorsal margin of the right valve with a complementary, but low, inconspicuous ridge on the left; surface marked by low, equidistant concentric lamellae which tend to be obsolete toward the posterior; the anterior end sculptured with numerous (11 to 17) fine radial ribs of varying width which tend to "frill" the concentric sculpturing; hinge typical, pallial sinus not seen.

This species may be distinguished by the fine radial ribs present on the anterior portion of the valve. It approaches *Semele quirosana*

H. K. Hodson (1931, p. 17, Pl. IX, figs. 8, 12) of the upper Oligocene of Venezuela in shape and size, but that species lacks the radial ribbing, has somewhat finer concentric sculpturing and the umbos are somewhat more anterior.

Pleiorytis caroniana (Maury)

Figure 11

Petricola caroniana MAURY, 1925, p. 274, Pl. XX, fig. 16.

Asaphis delicatus WEISBORD, 1929, Bull. Amer. Paleo., XIV, p. 257, Pl. XL, figs. 5, 6.

TOPOTYPE.—No. 24991; length 57.0 mm.; height 44.5 mm.; diameter (one valve) 22.0 mm.

Two specimens in the collection indicate that this species attains a size almost twice that indicated in the original description. The umbos in the adult form are but slightly anterior to the center of the dorsal margin and are definitely posterior to the anterior third of the shell.

The hinge as exposed in our specimens corresponds exactly with that of *Pleiorytis ovata* Conrad, 1862 (= *Petricola centenaria* Conrad, 1833) the monotypic species of *Pleiorytis* Conrad, 1862 (Acad. Nat. Sci., Phil. Proc. for 1862, p. 286) as figured by Gardner (1936, pp. 39–40, Pl. VI, figs. 3, 4), who has discussed the differences in habit which justify the recognition of this group as a generic entity separate from *Petricola*, a boring genus.

Psamosolen (?) **mansfieldi,** new species

Figure 13

HOLOTYPE.—No. 24995; length (slightly incomplete anteriorly) 49.0 mm.; height 16.0 mm.; diameter (one valve) 5.1 mm.

DESCRIPTION.—Shell of medium size, elongate, relatively thin; umbos low, inconspicuous, situated slightly posterior to the anterior third of the valve; dorsal and ventral margins sub-parallel, posterior broadly rounded, anterior broadly rounded ventrally, more sharply rounded dorsally; valve slightly gaping posterio-dorsally and posterio-ventrally, not gaping in the median posterior end; surface with a broad shallow inconspicuous median sulcus passing from the umbo to the ventral margin, and with a broad rounded ridge immediately posterior extending to the posterior ventral margin; the anterior and median portions of the valve smooth except for low concentric growth rugae; the posterior surface with shallow inconspicuous oblique grooves which tend to become obsolete on the posterior umbonal ridge and do not reach the ventral margin; hinge typical; pallial sinus tongue-shaped, deep, broad, rounded, extending forward slightly anterior to the middle of the valve.

P. (*?*) *mansfieldi* may be immediately distinguished from previously described species from this region by its much less strongly developed oblique sculpturing on the posterior portion of the valve, as well as by

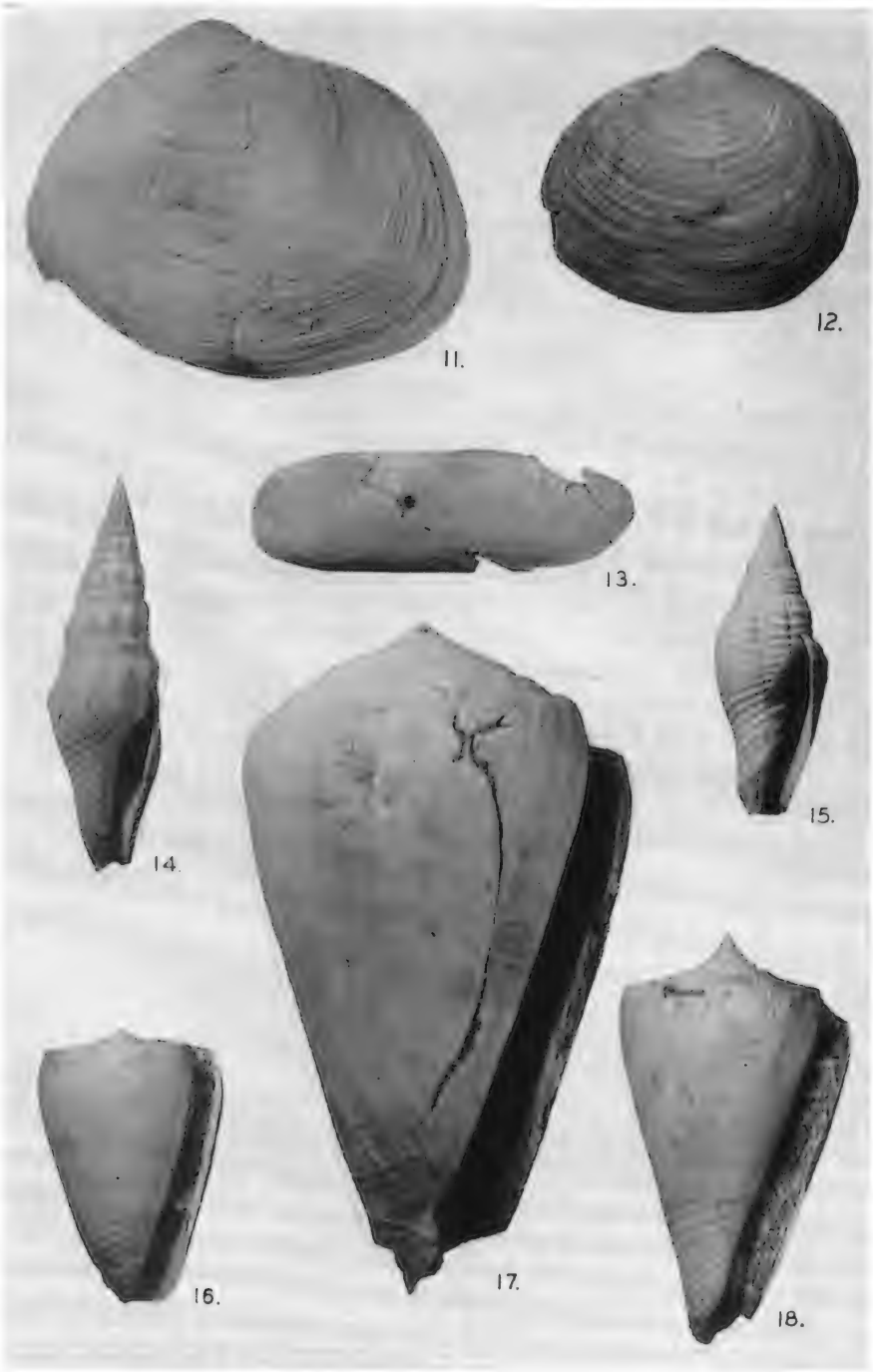


Fig. 11. *Pleiorytis caroniana* (Maury). Topotype, No. 24991; ×1.
Fig. 12. *Raëta meridionalis* Guppy. Topotype, No. 24993; ×1.
Fig. 13. *Psamosolen (?) mansfieldi*, n. sp. Holotype, No. 24995; ×1.
Fig. 14. *Crassispira henekeni caroniana* (Maury). Topotype, No. 24996; ×1.
Fig. 15. *Mitra (Tiara) woodringi*, n. sp. Holotype, No. 24997; ×1.
Fig. 16. *Conus (Lithoconus) couvaënsis*, n. sp. Holotype, No. 24998; ×1.
Fig. 17. *Conus (Dendroconus) maga*, n. sp. Holotype, No. 24999; ×1.
Fig. 18. *Conus (Leptoconus) medialira*, n. sp. Holotype, No. 25000; ×1.

its more centrally located umbos and narrower, more elongate valves. It is only questionably assigned to the genus *Psamosolen* Risso due to the absence of a distinct posterior gape, in the right valve at least. A slight gaping is to be observed in the dorsal and ventral posterior margins. The anterior margin is somewhat incomplete but there appears to have been a well-developed gape in that region.

I take pleasure in naming this species in honor of Dr. W. C. Mansfield of the United States Geological Survey, student of the American and West Indian Miocene molluscan faunas.

Raëta meridionalis (Guppy)

Figure 12

Raëta meridionalis GUPPY, 1911, p. 201, Pl. II, fig. 1; Harris' reprint, 1921, p. 164 (312), Pl. XII, fig. 1.

Labiosa (*Raëta*) *gabbi* PILSBRY AND JOHNSON, 1917, p. 202; PILSBRY, 1921, Pl. XLVI, fig. 11

TOPOTYPE.—No. 24993; length 41.0 mm.; height 33.5 mm.; diameter (both valves) 23.3 mm.

Two specimens are in the collection. They agree well with Guppy's poor figure and with that of the Santo Domingo fossil of Pilsbry and Johnson. This species is closely related to the recent East Pacific form *Raëta undulata* Gould.

Maury (1925, p. 331, Pl. XLII, fig. 9) has figured an imperfect specimen from Springvale as *Thracia* (*Cyathodonta*) *meridionalis*, stating: "In *Raëta* the undulations are very finely transversely marked with vermiculate striae, but the Trinidad fossil has much coarser streaks, like those of a paint brush when the paint is too thin." In the specimens at hand these striae are so finely developed as to be almost imperceptible. Further, Dr. Maury's specimen appears to have much less inflated umbos which are more centrally located and the surface of the shell is marked by prominent, broad, concentric undulations, while our fossils have a concentric ornamentation which has the appearance of low, widely separated ridges. Insofar as can be determined from Guppy's figure, the surface ornamentation was of the latter type. A single poor specimen in the collection has the shape and apparently the same general ornamentation as that figured by Dr. Maury. However, it seems best to await better material before formally naming this form.

Pholadomya species

An imperfectly preserved specimen serves to record the presence of this relatively rare genus in the Springvale fauna. It seems to be of

the general outline of *P. sawkinsi* Maury (1925, p. 333, Pl. XLII, fig. 10) but the details of the sculpturing more closely approximate that of *P. falconensis* F. and H. Hodson (1927, p. 44, Pl. XXVI, fig. 6; Pl. XXVII, figs. 1, 2).

Gastrochaena couvana, new species

Figure 8

HOLOTYPE.—No. 24990; length (slightly incomplete posteriorly) 17.2 mm.; height 8.8 mm.; diameter (left valve) 3.5 mm.

DESCRIPTION.—Shell small, slender, mytiliform, thin, widely gaping ventrally, less strongly gaping posteriorly, umbos nearly terminal, small, inconspicuous; acutely angulate anteriorly; sculpture of incrementals, crowded and somewhat rugose ventrally, hinge edentulous; myophore not preserved; pallial and adductor scars not observed.

G. couvana is distinguished from other described fossil and recent species in the narrower anterior portion of the valves. The umbos are more nearly terminal than in the recent species *G. cuneiformis* Spengler.

Conus (Leptoconus) medialira, new species

Figure 18

HOLOTYPE.—No. 25000; length 51.2 mm.; diameter 29.5 mm.

DESCRIPTION.—Shell of medium size, spire moderately high, concave in contour, shoulder truncate; nucleus smooth, rounded, erect, of two and one-half whorls; first two post-nuclear whorls tuberculate, the tubercles well developed at the nucleus and becoming progressively weaker; the subsequent volutions, eight to nine in number, excavated, marked only by growth lines; aperture broader anteriorly, outer lip moderately retractive, anal notch deep, siphonal notch weak, siphonal fasciole hardly discernible; lower part of body whorl marked by slightly irregular rounded spiral grooves separating flat-topped riblike spaces of approximately twice the width of the grooves, each with a median secondary groove.

Conus (*Leptoconus*) *stenostoma* Sowerby has a somewhat similar sculpture pattern on the body whorl, but differs markedly in its strongly retractive outer lip and in the shape and sculpturing of the spire whorls.

Conus (Lithoconus) couvaënsis, new species

Figure 16

HOLOTYPE.—No. 24998; length 33.7 mm.; diameter 23.5 mm.

DESCRIPTION.—Shell of medium size, spire low almost flat, shoulder angulate to sub-truncate; nucleus décolleté; post-nuclear whorls eight, deeply excavated on top, with a strong spiral ridge at the shoulder, otherwise lacking ornamentation; body whorl relatively short, broadly convex in outline, ornamented anteriorly by broad flat ribs which appear as if overlapping posteriorly; aperture broader anteriorly, outer lip moderately retractive, anal notch deep, siphonal notch shallow, siphonal fasciole slightly bulging.

The extremely low, almost flat spire, and the swollen convex outline of the body whorl serve to distinguish this species. *Conus veatchi* Olsson (1922, p. 216, Pl. v, figs. 5, 8) from the Middle Miocene Gatun Stage of Costa Rica has a somewhat similar shape. However, the body whorl is less inflated and the shoulder of the whorl is ornamented with ten to eleven fine spirals.

Conus (Dendroconus) maga, new species

Figure 17

Conus stenostoma SOWERBY, MAURY, 1925, p. 337, Pl. XLV, fig. 3. Not *Conus stenostoma* SOWERBY, 1850, Quart. Jour. Geol. Soc. London, VI, p. 44. See also MAURY, 1917, Bull. Amer. Paleo., V, p. 203, Pl. XXXII, fig. 4. WOODRING, 1928, p. 209, Pl. X, fig. 4.

? *Conus stenostomus* SOWERBY, GUPPY, 1910, pp. 4, 6. Harris' reprint, pp. 309, 311.

HOLOTYPE.—No. 24999; length 85.3 mm.; diameter 50.5 mm.

DESCRIPTION.—Shell large, spire relatively low, concavo-convex in outline, shoulder truncate; nuclear whorls décolleté; early post-nuclear volutions obscurely tuberculate, later whorls excavate above, marked by numerous fine microscopic striae which tend to be obsolete toward the outer edge, and by prominent lines of growth; aperture widened anteriorly, slightly flaring; outer lip moderately retractive, anal notch deep; siphonal notch wide, shallow; siphonal fasciole relatively wide; anterior portion of body whorl sculptured by irregularly spaced, rounded spiral threads which are obscurely beaded.

This species may be distinguished from *C. stenostoma* Sowerby, with which it has been confused, by the more deeply excavate anal fasciole, the finer spiral sculpturing on the spire whorls, the nature of the sculpturing on the anterior portion of the body whorl, and by the wide, shallow siphonal notch and the wide siphonal fasciole. *C. apium* Woodring (1928, p. 202, Pl. IX, fig. 3) has a lower spire, more rounded shoulder and less deeply excavate anal fasciole. *C. haitensis* Sowerby has a lower spire which is conspicuously striate spirally.

Conus species

The single imperfect specimen is distinguished by the slender body whorl which is twice the length of the diameter of the shell. The spire was apparently relatively high, the shoulder sharply angulate, smooth and but slightly concave above. The outer lip is sharply retractive and the anal notch deep. The anterior portion of the body whorl is marked by broad flat ribs separated by narrow sharp interspaces.

This form resembles *Conus furvoides* Gabb from the Miocene of Santo Domingo (see Pilsbry and Johnson, 1921, p. 328, Pl. XX, fig. 1), but differs in possessing a more strongly retractive outer lip, a deeper

anal notch, and the outer lip does not appear to have been so strongly flaring anteriorly.

Woodring (1928, p. 211) points out that "the cone from the Upper Miocene Beds at Springvale, Trinidad, described by Maury as *planiliratus* (see Maury, 1925, p. 338, Pl. XLV, fig. 6) lacks spirals on the anal fasciole and has widely spaced, narrow spiral grooves on the body whorl." It is not *C. planiliratus* Sowerby,[1] but not being represented in the collection it cannot be described here.

Cancellaria (Cancellaria) couvana, new species

Figure 21

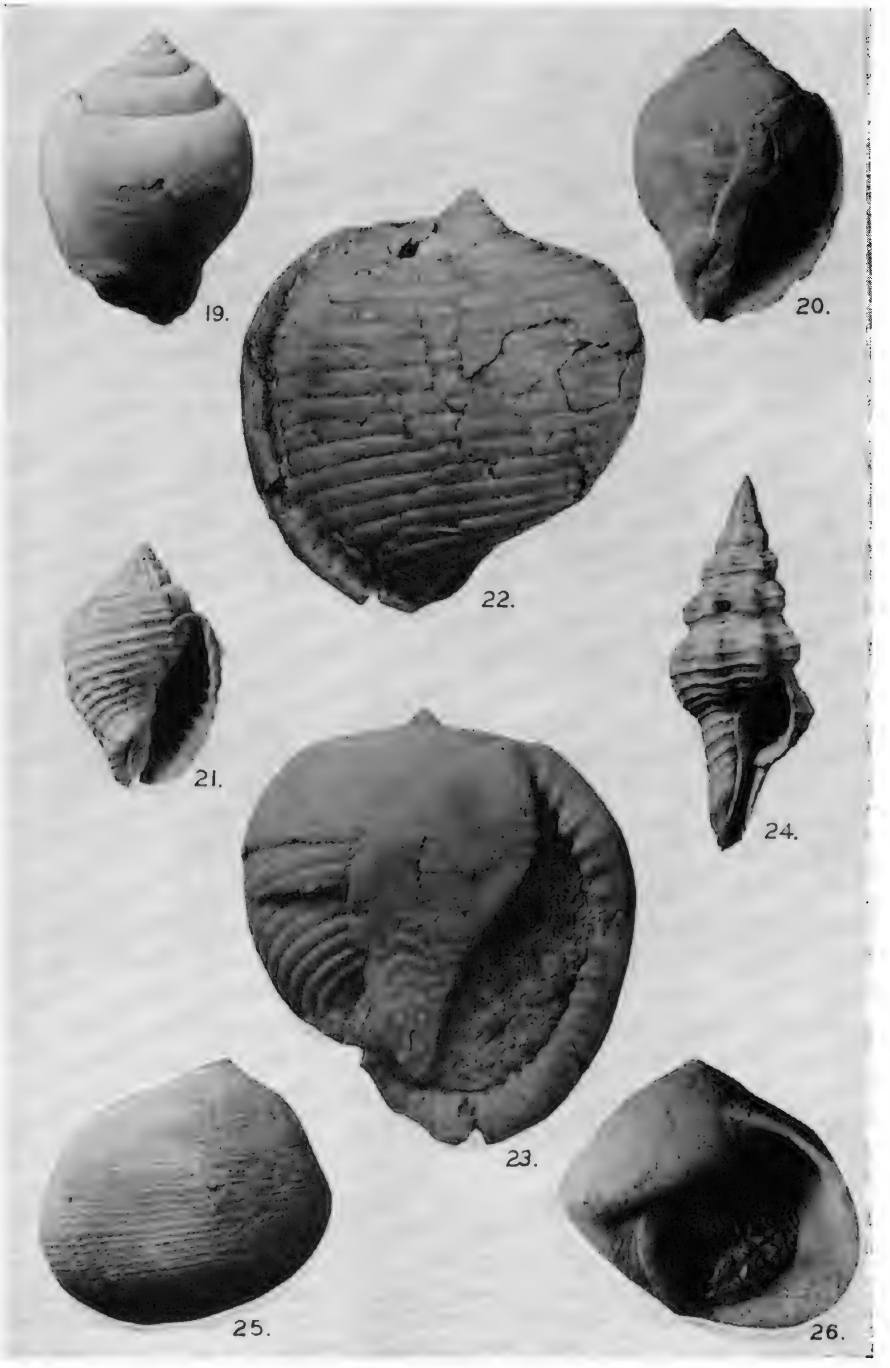
HOLOTYPE.—No. 24667; length 32.2 mm.; diameter 20.5 mm.

DESCRIPTION.—Shell of medium size, of two and one-half smooth naticoid nuclear whorls and six and one-half post-nuclear volutions; first post-nuclear whorl strongly convex, with four spiral threads and fifteen moderately retractive axials, beaded at the junction with the spiral ribs; on the second whorl a fine secondary spiral appears near the suture and another between the second and third primary ribs; the four anterior spirals become heavy, the other two near the suture are of secondary strength, the whorl becoming angulate at the posterior heavy spiral on the third post-nuclear volution and developing a flat-topped shoulder on the penultimate whorl; suture appressed on the spire whorls, deeply excavate on the body whorl: penultimate whorl marked with fourteen broad, rounded axials which form prominent nodes on the shoulder spiral; body whorl with thirteen spirals, the two on the shoulder of secondary strength, a third of primary strength forms the carinated shoulder angle and is strongly nodose to spinose at the junction with the broad, low axials; aperture moderately long, lunulate; outer lip with thirteen sharp lirae which are reduced to eight deep within the aperture; inner lip with a thin callus wash through which the spirals appear posteriorly; columellar plications typical; anterior canal short, siphonal notch shallow; siphonal fasciole high, with five low, inconspicuous spiral threads; a shallow umbilical groove occurs between the fasciole and the edge of the callus.

C. couvana resembles *C. venezuelana* Hodson (1931, p. 45, Pl. XXIII, figs. 1, 4) in its strongly carinated shouldered whorls, but differs in the absence of secondary ribbing on the body whorl and in the number of axial riblets on the spire whorls. *C. springvaleënsis* Mansfield (1925, p. 31, Pl. II, fig. 12) does not possess the sharp carinated shoulder, has a shorter, proportionately broader aperture, and the callus wash is thinner with stronger columellar plications.

Maury's Springvale record of *C. epistomifera* Guppy (1925, p. 345, Pl. XLVI, fig. 7) is based upon "a single young, and somewhat crushed specimen." The figure is very poor, but insofar as it can be interpreted seems to represent *C. springvaleënsis* Mansfield.

[1] Sowerby, 1850, Quart. Jour. Geol. Soc. London, VI, p. 44.



Figs. 19, 20. *Cancellaria* (*Cancellaria*) *auriculaperta*, n. sp. Holotype, No. 24665; ×1.

Fig. 21. *Cancellaria* (*Cancellaria*) *couwana*, n. sp. Holotype, No. 24667; ×1.

Figs. 22, 23. *Semicassis* (*Tylocassis*) *maleaformis*, n. sp. Holotype, No. 24679; ×1.

Fig. 24. *Latirus* (*Polygona*) *infundibulum* cf. *polius* Woodring. Hypotype, No. 25001; ×1.

Figs. 25, 26. *Sinum naticoidalis*, n. sp. Holotype, No. 25002; ×1.

Cancellaria (Cancellaria) auriculaperta, new species

Figures 19, 20

HOLOTYPE.—No. 24665; length 36.8 mm.; diameter 27.0 mm.

DESCRIPTION.—Shell moderately large, inflated, spire low, nucleus décolleté, smooth; post-nuclear whorls six, tabulate; early whorls ornamented with numerous broad, rounded axial ribs separated by interspaces of equal width, and with about seven low, rounded spirals which are not as strongly developed as the axials; on the later spire whorls the axials tend to disappear and are wholly absent on the penultimate and ultimate volutions, the spiral cords likewise become obsolete, the body whorl being smooth save for many fine striae and nine or ten low, rounded spirals on the base; aperture lunate, wide, slightly flared and notched posteriorly; outer lip flaring at the distinct stromboid notch, interior with 19 low lirae, anterior canal short; inner lip with a heavy parietal callus; columella triplicate, the posterior plication well developed, deep within the aperture, nearly horizontal, situated anterior to the posterior margin of the siphonal fasciole, and separated from the anterior plications by an elongate bead-like denticle: anterior plications extending almost to the edge of the callus; siphonal fasciole strong, bulging, sub-angulate posteriorly.

Cancellaria auriculaperta resembles *C. laevescens laevescens* Guppy and *C. l. portoricana* Maury in the reduction of the sculpturing on the body whorl. It may be readily distinguished from these species by the absence of sculpturing on the penultimate as well as on the body whorl. The spire is lower, the aperture longer and wider with a greater number of lirae on the inner lip and less strongly developed columellar plications, the posterior of which does not extend to the edge of the callus.

C. scheibei Anderson (1929, p. 115, Pl. x, figs. 1, 2, 3, 4) from the Miocene of Colombia is more inflated and has a less strongly developed shoulder. *C. cibarcola* Anderson (1929, p. 116, Pl. xiv, figs. 1, 2, 3) is apparently a related species, but differs in possessing more strongly developed spiral sculpturing on the spire whorls resulting in a "disposition toward a truly cancellated sculpture in the young stages." The columella has two elongate denticles between the posterior and the more anterior plications.

Mitra (Tiara) woodringi, new species

Figure 15

HOLOTYPE.—No. 24997; length 37.8 mm.; diameter 14.0 mm.

DESCRIPTION.—Shell of medium size, moderately inflated, of nine post-nuclear whorls; nucleus smooth, somewhat décolleté; spire whorls convex, ornamented by five revolving ribs which on the early volutions are separated by narrow linear interspaces cancellated by lines of growth; later whorls somewhat shouldered with a low riblet at the slightly excavate suture; sculpture on the body whorl consisting of three strong, distant spirals anterior to the sutural rib, the median one forming the slight

shoulder of the whorl, anterior are four slightly weaker ribs separated by interspaces of approximately equal width; base of whorl moderately constricted, marked by eight ribs which are more finely developed posteriorly and become progressively heavier and more distant anteriorly; growth lines prominent only on the early post-nuclear whorls; aperture elongate, outer lip simple, inner lip with a thin callus wash marked with three strong folds and a fourth minor fold deeply set within; siphonal fasciole strongly developed, bulging; siphonal notch deep.

This species somewhat resembles *M. sancti-francisci* Maury (1925, p. 356, Pl. XLVI, fig. 13) which also occurs at Springvale, but may be readily distinguished by the absence of the central constricted region on the ultimate whorl. The Costa Rican species, *M. limonensis* Olsson (1922, p. 272, Pl. IX, fig. 1) is a more slender form with a higher spire which differs in the details of the sculpturing. The specimen figured by Weisbord as *Mitra* cf. *limonensis* (1929, p. 280, Pl. XLI, fig. 13) is more closely related. Our species seems to be slightly more inflated, has but a single riblet near the suture and the anterior canal is somewhat longer.

This species is named in honor of Dr. W. P. Woodring of the United States Geological Survey.

Latirus (Polygona) infundibulum Gmelin cf. **polius** Woodring

Figure 24

Latirus (Polygona) infundibulum polius WOODRING, 1928, p. 253, Pl. XV, figs. 4, 5.

HYPOTYPE.—No. 25001; length 45.8 mm.; diameter 18.5 mm.

Six specimens in the collection agree with the Bowden subspecies in being considerably smaller than typical *L. infundibulum* and in having more prominent ribbing. Three of the specimens possess nine axials and three show eight, being somewhat intermediate between *L. i. infundibulum* and *L. i. polius* in this respect.

Fusinus springvalensis (Maury)

Figures 27, 28

Fusus springvalensis MAURY, 1925, p. 358, Pl. XLVI, fig. 11.

TOPOTYPES.—No. 24671; length 92.4 mm.; diameter (slightly distorted) 33.0 mm. No. 24690; length 126.5 mm.; diameter 42.5 mm.

The two topotypes in the collection, while both incomplete, are nevertheless more satisfactory than the holotype as figured by Dr. Maury. They indicate that the relative strength or the presence or absence of axial ribbing on the later whorls is not a diagnostic feature. Topotype 24690 possesses strong axial ribbing on the early post-nuclear whorls. This ribbing becomes obsolete on two and one-half turns and then reappears suddenly as sub-equal nodose swellings on the middle

of the whorl. These persist for approximately one volution, but are again obsolete on the penultimate and ultimate whorls. On topotype 24671 swollen axials persist on all the spire whorls but are absent on the body whorl.

The most distinctive feature of this species is the presence of interribbing between most, but not all the primary spirals. The spirals are essentially triangular in section and are all marked by fine, microscopic striae, which are also present in the interspaces.

Fusinus magdalenensis Anderson (1929, p. 133, Pl. xv, figs. 1, 2, 3) seems to be closely related.

Cassis, species aff. **tuberosa** Lamarck

Fragments including much of the callus of the inner lip, the basal portion of the body whorl, and the thickened outer lip complete nearly to the shoulder have a height of 210 mm. and indicate that the specimen complete must have been about 250 mm. high. The principal differences separating the recent species *C. tuberosa* Lamarck from the more common Miocene species *C. sulcifera* Sowerby are the larger size and the finer axial ribbing of the former species. The specimen at hand seems to have been approximately two and one-half times the size of normal specimens of *C. sulcifera* and is therefore tentatively referred to *C. tuberosa.*

Semicassis (Tylocassis) maleaformis, new species

Figures 22, 23

Hypotype.—No. 24679; length 56.7 mm.; diameter (somewhat crushed) 51.0 mm.

Description.—Shell moderately large, inflated, spire relatively low; nucleus smooth, naticoid, of about two and one-half whorls; post-nuclear whorls five, those preceding the penultimate whorl angulate at the shoulder, sculptured with six spiral threads cancellated by numerous retractive axials; penultimate and ultimate whorls marked by broad spiral bands; aperture lunulate, wide, outer lip strongly thickened forming a prominent varix with strong lirate denticulations on the inner edge; inner lip with a heavy callus detached at the base but fused to the body whorl above; basal region of callus with many denticles; parietal wall with numerous ridges; base of aperture deeply emarginate forming a short canal, strongly twisted; siphonal fasciole broken, apparently greatly inflated.

The only specimen is somewhat distorted and crushed, but is so unique as to merit description. Its gross shape and the general sculpturing of the ultimate and penultimate whorls strongly resembles that of *Malea camura* Guppy. It most nearly approaches *S. inflata* (Shaw) but may be distinguished from that species by the lower spire and the lack of any axial sculpturing on the penultimate and body whorls.

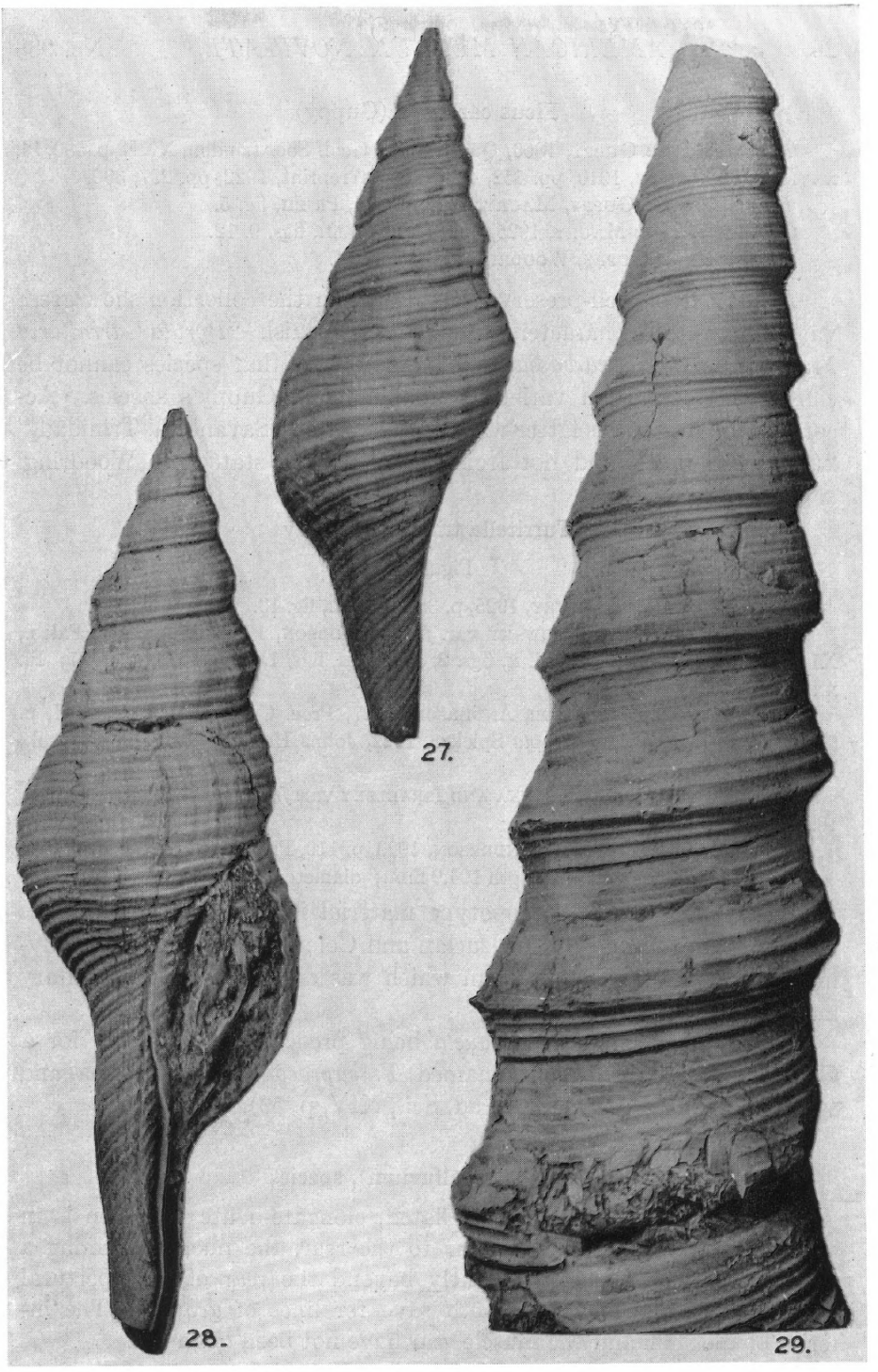


Fig. 27. *Fusinus springvalensis* (Maury). Topotype, No. 24671; ×1.
Fig. 28. *Fusinus springvalensis* (Maury). Topotype, No. 24690; ×1.
Fig. 29. *Turritella trinitaria* Maury. Topotype, No. 24697; ×1.

Ficus carbasea (Guppy)

Ficula carbasea Guppy, 1866, Quart. Jour. Geol. Soc. London, XXII, p. 580, Pl. xxvi, fig. 7. Guppy, 1910, pp. 452, 456; Harris' reprint, 1922, pp. 297, 300.

Pyrula carbasea Guppy, Maury, 1925, p. 376, Pl. lii, fig. 5.

Pyrula trinitaria Maury, 1925, pp. 374–5, Pl. lii, figs. 9, 12.

Ficus carbasea Guppy, Woodring, 1928, p. 314.

A number of well-preserved specimens in the collection show great variation in the characters used to distinguish "*Pyrula*" *trinitaria* Maury from *Ficus carbasea*, and indicate that that species cannot be considered more than varietally distinct from Guppy's species. According to Guppy this latter was described from "Savanetta, Trinidad," "(Caroni Series)" and not from Springvale as stated by Woodring.

Turritella trinitaria Maury

Figure 29

Turritella trinitaria Maury, 1925, p. 382, Pl. liii, fig. 10.

Turritella robusta Grzybowsky var. *fredeai* Hodson, 1926, Bull. Amer. Paleo., XI, p. 183, Pl. ix, figs. 1, 3; Pl. x, figs. 2, 5; Pl. xi, figs. 1, 6, 7; Pl. xiii, fig. 7; Pl. xxxiii, fig. 6.

Turritella abrupta Spieker, Anderson, 1927, Proc. Calif. Acad. Sci., XVI, p. 89. Not *T. robusta* var. *abrupta* Spieker, 1922, Johns Hopkins Univ. Publ. Geol., No. 3, p. 85, Pl. iv, fig. 6.

Turritella supraconcava Hanna and Israelsky var. *fredeai* Hodson, Weisbord, 1929, p. 263, Pl. xliv, figs. 3, 4.

Turritella fredeai Hodson, Anderson, 1929, p. 119, Pl. xvii, fig. 1.

Topotype.—No. 24697; length 194.0 mm.; diameter 55.4 mm.

Well preserved, adult topotype material indicates that *T. fredeai* Hodson, the well-known Venezuelan and Colombian species is synonymous with this Springvale form which was described on fragmentary material.

Grzybowsky's name *T. robusta* being preoccupied by Gabb for a California fossil has been renamed *T. supraconcava* by Hanna and Israelsky (1925, Proc. Calif. Acad. Sci., XIV, p. 59).

Capulus (Malluvium), species

A single small, moderately inflated, elongate-ovate specimen is in the collection. The apex lies far to the rear, the nucleus forming a dextral coil which extends slightly beyond the rear of the apertural opening. The surface is smooth save for lines of growth. The interior of the shell and the muscle scar have not been observed.

Capulus effluens Guppy (1911, pp. 197, 199) is not a *Malluvium*.

Listed by Guppy as *Capulus*, it was described as a *Cadulus*. The description indicates that the former is the correct generic reference.

Sinum naticoidalis, new species

Figures 25, 26

HOLOTYPE.—No. 25002; length 36.5 mm.; diameter 39.0 mm.

DESCRIPTION.—Shell large, thick, moderately inflated, not flattened, spire slightly elevated; nucleus décolleté, whorls rapidly enlarging, sculptured with numerous fine primary spirals separated by interspaces of slightly greater width each of which bears a thread-like secondary spiral; aperture wide, almost circular, inner lip with a thin callus, slightly reflected to form a small umbilical chink.

S. naticoidalis is unique among the Miocene species of this genus from the West Indian region. The high shell showing no evidence of being flattened is approached only by the Dominican species *S. nolani* Maury, which, however, is almost smooth. The shape of the aperture is reminiscent of *S. excentricum* Guppy, but that species is somewhat flattened and possesses a spiral sculpture of three orders of magnitude.

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